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**Research Article**

# Formulation and Evaluation of Herbal Tanning Lotion

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**ABSTRACT**

Natural substances extracted from plants have recently been considered as potential sunscreen resources owing to high ultraviolet ray absorption and antioxidant activity. The decrease in the intensity of UV radiation reaching the skin through sunscreens may reduce the risk of sun-induced skin cancer. The present study attempts to develop sunscreen lotions, possessing broad spectrum of anti-UV radiation effectiveness with reduced concentration of chemical UV filters, from the extracts of bioactive products such as *Pleiogynium cerasiferum* & *Polyalthia longifolia*. The effectiveness of the product was evaluated using Sun Protection Factor (SPF). The aim of this study was to develop herbal topical sunscreen formulation based on some fixed oils, in combination with some medical plants. Regular use of sunscreen reduces the development of actinic keratosis, squamous cell carcinoma and melanoma. Sunscreen may be organic or inorganic chemicals. Sunscreen is also known as sun block lotion. The product that absorb or reflect the sun's ultraviolet radiation and protect the skin. The increasing incidence of skin cancers and photo damaging effects caused by ultraviolet radiation has increased the use of sunsreening agents, which have shown beneficial effects in reducing the symptoms**.**

**Keywords:** *Pleiogynium cerasiferum*, *Polyalthia longifolia,* skin cancer, fixed oils

**Article Info**

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**CONTENTS**



## 1. Introduction

Sunscreens are providing protection to the skin and avoid for the harmful skin cancers and skin aging. Sunscreen protects the skin from the sun's harmful UV rays, which present into two forms UVA& UVB Rays. That cause the

skin damage like skin aging, wrinkles, and age spots that make skin look prematurely older. Sunscreen is also beneficial to your skin in other ways. It protects delicate skin from sunburn while also reducing the visible signs of UV damage such as discolorations and dark spots, sagging or leathery skin, and wrinkles. These safeguards aid in the overall maintenance of a more even skin tone. Sunscreen keeps your skin more advantageous in different ways too. It ensures delicate skin against sunburn and it diminishes the presence of sun harm – stains and dim spots, rough skin, and wrinkles. These insurances help your skin keep up. Chemical sunscreens are avoided by many people with sensitive skin, such as those who suffer from skin hypersensitivity. Skin exposure to unknown substances is a source of concern chemicals. Although a range of hypoallergenic cosmetic products have been created for clients with sensitive skin, the number of sunscreen agents available is still limited. Researchers now say that cosmetics with herbal components are better for hyper allergic skin since they are less irritating and more easily adjusted to the skin. Patient's favourite treatments for sunburn are topical cosmetic formulations, which are frequently prescribed by family physicians and dermatologists. Topical therapies are preferred by patients because they have less adverse effects, are easier to use, are less expensive, and are more commonly available. To obtain a good photoprotection effect, herbal cosmetics must contain one or more active sun screening agents with antioxidant capabilities. The concept of complementary or alternative medicine is becoming more commonly acknowledged, and herbal medicines are growing more popular as a result. Herbal cosmeceuticals are natural remedies whose constituents have properties to rejuvenate and protect the skin from pollution, pollutants, atmospheric temperature fluctuations, UVA and UVB radiation, wrinkles, hyper pigmentation (excessive tanning), and inflammations. More effective formulations with herbal components may become popular in the future. The therapeutic application of herbal extracts necessitates a greater understanding of herbal potential. The current trend toward herbal cosmetics with effective medicinal properties will likely continue, and newer herbs may be introduced into the cosmetics world [Gediya, et al., 2011].

## 2. Materials and Methods

**Collection and Identification of Plant material:**

The Leaves and Bark of *Pleiogynium cerasiferum* and *Polyalthia longifolia* were collected from Tirumala Hills, Tirupati. Both the plants were identified. Authentication of the plants is done by the taxonomist of Botanical Survey of India. Both the plants were washed properly and then used for further investigations.

**Extraction of plants**

**Preparation of Leaf Extracts of *Polyalthia longifolia***

The leaves powder of *Polyalthia longifolia* was extracted with Water, Ethanol, & Petroleum Ether by cold maceration for 72 hrs. The extracts were concentrated after being filtered with Whatman filter paper.

**Preparation of Leaf Extracts of *Pleiogynium cerasiferum***

The leaves powder of *Pleiogynium cerasiferum* was extracted with Water, Ethanol, & Petroleum Ether by cold maceration for 72 hrs. Whatman filter paper was used to filter and concentrate the extracts.

**Sun protective activity of different extracts** [Mbanga, L., et al., 2015]

**Sample preparation:**

Weighing 0.2gm of extract, transferring it to a 100 ml volumetric flask, diluting it to volume with ethanol, and filtering it through cotton yielded a 2000 ppm solution. After discarding the first ten ml, a 25.0 ml aliquot was transferred to a 50 ml volumetric flask and diluted to volume with ethanol to make a 1000 ppm solution. The capacity was then finished with ethanol by transferring a 25.0 ml aliquot to a 50 ml volumetric flask (500 ppm solution).

**Sun protective activity of different extracts of leaves and barks of *Pleiogynium cerasiferum*.**

**Sample preparation of aqueous extract of leaves of *Pleiogynium cerasiferum*.**

0.2g of extracts of leaves and barks of *Pleiogynium cerasiferum* were weighed separately & transferred to a 100 ml volumetric flask and diluted with ethanol. First 10 ml volume was discarded. In next step 25.0 ml of aliquot transfer to 50 ml volumetric flask and makeup volume with ethanol. after that again transfer 25.0 ml of aliquot to 50 ml volumetric flask and makeup volume with ethanol.

**Sample preparation of Ethanolic extract of leaves of *Pleiogynium cerasiferum***: 0.2g of extracts of leaves and barks of *Pleiogynium cerasiferum* were weighed separately & transferred to a 100 ml volumetric flask and diluted with ethanol. First 10 ml volume was discarded. In next step 25.0 ml of aliquot transfer to 50 ml volumetric flask and makeup volume with ethanol. after that again transfer 25.0 ml of aliquot to 50 ml volumetric flask and makeup volume with ethanol.

**Sample preparation of different extracts of leaves of *Polyalthia longifolia***

**Sample preparation of aqueous extract of leaves of *Polyalthia longifolia.***

0.2g of extracts of leaves and barks of *Polyalthia longifolia* were weighed separately & transferred to a 100 ml volumetric flask and diluted with ethanol. First 10 ml volume was discarded. In next step 25.0 ml of aliquot transfer to 50 ml volumetric flask and makeup volume with ethanol. after that again transfer 25.0 ml of aliquot to 50 ml volumetric flask and makeup volume with ethanol

**Sample preparation of Ethanolic extract of leaves of *Polyalthia longifolia*.**

0.2g of extracts of leaves of *Polyalthia longifolia* were weighed separately & transferred to a 100 ml volumetric flask and diluted with ethanol. First 10 ml volume was

discarded. In next step 25.0 ml of aliquot transfer to 50 ml volumetric flask and makeup volume with ethanol. After that again transfer 25.0 ml of aliquot to 50 ml volumetric flask and makeup volume with ethanol.

**Determine the *In vitro* Sun protective factor from the Extracts: [**Imam, et al., 2015**]**

The sun protection factor (SPF) is the ratio of UV energy necessary to create a minimal erythemal dose (MED) in protected skin to unprotected skin, and it is used to measure the effectiveness of sunscreens. For the determination of the Effectiveness of the sunscreen the Sun Protection Factor is used. Screening the absorbance of the product between 290-320 nm at 5 nm intervals is a simple, fast, and reliable in vitro method of estimating the SPF. The Mansur equation is used for the determination of SPF value by using the formula

$$SPF_{spectrophootometric} = CF \times \sum_{290}^{320} EE\,(\lambda) \times I\,(\lambda) \times Abs\,(\lambda)$$

CF =Correction factor (10),

EE (λ)=Erythmogenic impact of wavelength radiation, λ

Abs (λ)=Values of Spectrophotometric absorbance at wavelength λ EE stands for erythemal effect spectrum, and I is for solar intensity spectrum. The absorbance & Sun Protection factor of the Extracts calculated by UV-Spectrophotometric method.

**Formulations of the Extracts [**Deuschle, et al., 2015**]**

Sunscreens are now found in a variety of products, including moisturisers, creams, lotions, and other hair and skin treatments. The use of these items on a daily basis may assist to lower the risk of UV radiation's negative effects. The capacity of a sunscreen to block UV-B is more significant for preventing the harmful impacts of sun exposure. However, a very effective sunscreen ingredient must be employed in the cosmetic composition.

**Formulation of the Tanning Lotion of ethanolic & Aqueous extracts of leaves of *Polyalthia longifolia,* ethanolic & Aqueous extracts of *Pleiogynium cerasiferum* leaves**

**The following method was used to formulate sunscreen lotion- Formulation of Tanning lotion** [Sopyan, et al., 2018, Rasheed, et al., 2012]

Take all the ingredients like cetyl alcohol, stearic acid, glycerin given in Table 4. 2 equal quantity and weight. In a 400 mL beaker, water was measured and collected. Add triethanolamine into water and stirred. Then heat the water solution up to temperature of 80°C to 85°C then add melted cetyl alcohol, stearic acid, glycerol, and methyl paraben were slowly poured into the water solution and stirring constantly. Stirring was continued until a smooth and uniform paste was obtained. Then add ethanolic extract of leaves and bark of *Polyalthia longifolia,* ethanolic extract of leaves of *Pleiogynium cerasiferum* and aqueous extract of *Pleiogynium cerasiferum* bark and stirred well until all the ingredients mixed uniformly.

Table 1: Composition of Herbal Lotion

| S. No. | Ingredient | Formula %W/W |
|---|---|---|
| 1 | Extract | 5 |
| 2 | Stearic acid | 11 |
| 3 | Glycerol | 3 |
| 4 | Triethanolamine | 0.5 |
| 5 | Cetyl alcohol | 4 |
| 6 | Na Methyl paraben | 0.02 |
| **7** | Purified water | q.s. (Up to 100) |

Evaluation of Lotion [Yaseen, Mariam, et al., 2018]

**Appearance:** Colour, Texture, odour

- pH
- Viscosity
- Spreadability
- Homogeneity

After feel, Type of smear, Removal

**Appearance:** Colour, texture, and Odour were used to assess the cream's appearance.

**pH:** A standard buffer solution was used to calibrate the pH metre. The pH of 0.5g of cream was determined after it was weighed and diluted in 50.0 ml of distilled water. [Deuschle, et al., 2015].

**Viscosity:** The viscosity of the formulation was measured using a Brookfield Viscometer at 25 rpm and spindle number 64. [Pachpawar et al., 2018]

**Spread ability:** The most common approach for testing the spreadability of semisolid preparations is the parallel plate method. Spreadability was assessed using a modified laboratory set up. Two glass slides were put on a tripod stand, and an excess of cream (3g) was applied in between the two glass slides. The upper slide can be moved, while the lower slide is securely attached to the stand. The cream was compressed to a consistent thickness by placing a 100 g weight on them for 5 minutes, and the surplus cream was scraped off the edges. The slide was then given a 50 g weight on one side and pulled until it covered a distance of 10 cm. Spreadability was measured by the time it took to separate two glass slides by 10 cm in seconds. A shorter period indicates better spreadability. The formula was used to calculate the spreadability is

$S = m.l/t$

Where S=Spreadability,

m=Weight tied to upper glass slide, l=Length of glass slide, and

t=Time taken to separate them [Deuschle, et al., 2015, Shah, Samip, et al., 2013]

**Homogeneity:** Touch and visual appearance were used to assess homogeneity.

**After feel:** After applying a predetermined amount of cream, the emollience, slipperiness, and amount of residue left were assessed.

**Type of smear:** The type of film or smear created on the skin after application of the cream was examined.

**Removal:** The ease with which the cream applied could be removed was tested by rinsing the applied region with tap water.

**Determine the Effectiveness of sunscreen Formulations by comparing with marketed sunscreen formulation:** For the determination of the Effectiveness of the sunscreen the Sun Protection Factor is used. In vitro method used for calculating the SPF value by using spectroscopic method and estimate the wavelength on 290-320 nm at equally 5 nm intervals. The Mansur equation is used for the determination of SPF value by using the formula

$$SPF_{spectrophootometric} = CF \times \sum_{290}^{320} EE\,(\lambda) \times I\,(\lambda) \times Abs\,(\lambda)$$

CF = Correction factor (10),
EE (λ) = Erythrogenic impact of wavelength radiation, λ
Abs (λ) = Values of Spectrophotometric absorbance at wavelength λ

EE stands for erythemal effect spectrum, and I is for solar intensity spectrum. The absorbance & Sun Protection factor of the formulations is calculated by UV-Spectrophotometric method.

**3. Results & discussion:**

Table 2.1: Phytochemical investigations of petroleum ether, ethanol, and water extracts of leaves of *Polyalthia longifolia*.

| Chemical constituents | Ethanol extract | Aqueous extract |
|---|---|---|
| Alkaloids | + | - |
| Carbohydrates | + | + |
| Glycosides | + | - |
| Tannins | + | + |
| Saponin | - | - |
| Flavonoids | + | + |
| Phenols | + | + |
| Steroids | - | + |

(+) =Present, (-) = Absence

Phytochemical investigations were done for ethanol, and water extracts of leaves of *Polyalthia longifolia* and it was found that carbohydrates, tannins, flavonoids & phenol compounds are present in all the samples. Few tests are positive for alkaloids, glycosides and steroids. Saponins was absent in all the extracts.

Table 2.2: Phytochemical investigations of ethanol, and water extracts of leaves of *Pleiogynium cerasiferum*

| Chemical Constituents | Ethanol extract | Aqueous extract |
|---|---|---|
| Alkaloids | + | - |
| Carbohydrates | + | + |
| Glycosides | + | - |
| Tannins | + | + |
| Saponin | + | + |
| Flavonoids | + | + |
| Phenols | - | + |
| Steroids | - | - |

(+) =Present, (-)= Absence

Phytochemical investigations were done for ethanol, and water extracts of leaves of Pleiogynium cerasiferum and it was found that carbohydrates, flavonoids, tannins compounds are present in all the samples. Few tests are positive for alkaloids, glycosides, saponins & phenols. Steroids was absent in all the extract.

Table3: SPF values of the Aqueous extract of leaves of *Polyalthia longifolia* plant extracts

| **SPF values of the Aqueous extract of leaves of *Polyalthia longifolia* plant extracts** | | | |
|---|---|---|---|
| Nm | EE x I | Abs. | EE x I x Abs. |
| 290 | 0.0150 | 0.4138 | 0.0062 |
| 295 | 0.0817 | 0.4009 | 0.0327 |
| 300 | 0.2874 | 0.3835 | 0.1102 |
| 305 | 0.3278 | 0.3700 | 0.1212 |
| 310 | 0.1864 | 0.3522 | 0.0656 |
| 315 | 0.0839 | 0.3401 | 0.0285 |

| | | | |
|---|---|---|---|
| 320 | 0.0180 | 0.3270 | 0.0058 |
| **SPF** | | **3.70** | |

**Table4: SPF values of the Ethanol extract of leaves of *Polyalthia longifolia* plant extracts**

| **SPF values of the Ethanol extract of leaves of *Polyalthia longifolia* plant extracts** | | | |
|---|---|---|---|
| **Nm** | **EE x I** | **Abs.** | **EE x I x Abs.** |
| **290** | 0.0150 | **1.0056** | **0.0150** |
| **295** | 0.0817 | **0.9791** | **0.0799** |
| **300** | 0.2874 | **0.9406** | **0.2703** |
| **305** | 0.3278 | **0.9282** | **0.3042** |
| **310** | 0.1864 | **0.9302** | **0.1733** |
| **315** | 0.0839 | **0.9510** | **0.0797** |
| **320** | 0.0180 | **0.9720** | **0.0174** |
| **SPF** | | **9.40** | |

**Discussion:**

The sun protection factor (SPF) is determined by dividing the UV energy required to produce a minimal erythema dose (MED) on protected skin by the UV energy required to produce a MED on unprotected skin to determine the efficacy of a sunscreen. The higher the SPF, the better the product is in protecting you from sunburn. Methods for calculating the SPF of commercially available commodities, on the other hand, must be developed. (Singhal, M. et al 2011). Present work is an attempt to compile formulations and evaluation of sun protective activity of *Pleiogynium cerasiferum* & *Polyalthia longifolia*. Both plants were Authentified by Botanical Survey of India, Phytochemical investigations were done for ethanol, and water extracts of leaves of *Polyalthia longifolia* and it was found that Carbohydrates Tannins, Flavonoids & Phenol compounds are present in all the samples. Few tests are positive for Alkaloids, Glycosides and Steroids. Saponin was absent in all the extracts. In petroleum ether, ethanol, and water extracts of bark of *Polyalthia longifolia* and it was found that, Flavonoids, Tannins & Phenols compounds are present in all the samples. Few tests are positive for Alkaloids, Carbohydrates, Glycosides & Steroids. In leaves of *Pleiogynium cerasiferum* and it was found that Carbohydrates, Flavonoids, Tannins compounds are present in all the samples.

Few tests are positive for Alkaloids, Glycosides, Saponin & Phenols. Steroids was absent in all the extract. Sunscreen activity of plant extract found to be the aqueous extract and Ethanol extract extract of leaves of *Polyalthia longifolia* plant extracts 3.70, 9.40 & 2.12 respectively. In SPF value of Aqueous extract of Leaves of *Pleiogynium cerasiferum* 1.10, ethanol extract of leaves of *Pleiogynium cerasiferum* found that 3.92, Pet. ether extract of Leaves of *Pleiogynium cerasiferum* found that 0.36. Formulation of the extracts are prepared and evaluated on the basis of Color, Texture, Odour, Spreadability, pH, Viscosity, Homogeneity, After feel, Type of smear, Removal. Sunscreen activity of cream formulation of ethanol extract of *Polyalthia longifolia* was found 0.30, Lotion Formulation of leaves extract of *Polyalthia longifolia* found 0.21. SPF value of Lotion Formulation of Leaves extract of *P. cerasiferum* found that 0.14. SPF activity compared with Marketed formulation. The Ethanol extract of *Polyalthia longifolia* has reported Rf values 0.45. By comparing the peak area of the standard to the amount of marker compound present in the extract, the quantity of marker compound present in the extract was measured.

**4. Conclusion**

The phytochemical screening of extracts as well as the assessment of phenolic and flavonoids content by quantitively & qualitatively by HPTLC, were reported in this work, which could be associated to the photoprotective effects seen in the tested extracts. The extracts also proven to be intriguing for planning new experiments aimed at incorporating the extracts into photoprotective cosmetic formulations when compared to the literature data. Excessive sun exposure is the most common external cause of skin damage, hastening skin ageing and increasing the chance of getting skin cancer. Photo protective chemicals are extremely useful for minimizing the skin's exposure to ultraviolet (UV) light. Many UV filters, especially organic sunscreens, are, nevertheless, allergenic. As a result, extensive research is being conducted into the development of formulations incorporating plant extracts, which may be significantly safer. Plant-based cosmetics are often used to prevent skin ageing because they include antioxidants that reduce free radical activity, and various researchers have looked at the skin-prolonging properties of these products. It was reported in the past that the plant Pleiogynium cerasiferum & Polyalthia longifolia had different kinds of medicinal importance.

The goal of this study was to see how effective Polyalthia longifolia and Pleiogynium cerasiferum extracts are as a sun protection factor. The SPF value of ethanol, aqueous, and petroleum ether extracts of leaves of Polyalthia longifolia and Pleiogynium cerasiferum was measured using a UV spectrophotometer. The study looked at the efficacy of extracts of leaves of Polyalthia longifolia and Pleiogynium cerasiferum in developing herbal sunscreen formulations and avoiding sunburn. Results demonstrate that the ethanol leaf and bark extract of Polyalthia longifolia, ethanol leaf extract of Pleiogynium cerasiferum & aqueous extract of Pleiogynium cerasiferum bark showed good SPF value rather than other extracts & shown to be more stable in the study. Formulations of the extracts were created i.e., lotion & evaluated on the basis of color, texture, odour, spreadability, pH, viscosity, homogeneity, after feel, type of smear, removal. There is a large market potential for sunscreen ingredients. Stable and uniform UVA/UVB protective sunscreen with SPF potential can undoubtedly give effects, particularly against free radical-induced skin damage as well as UV-ray blocking. All of the findings indicated that the designed Tanning lotion were physically stable and may be used as an active sun screening agent to protect the skin from damaging UVR. Results demonstrate that these extracts and their formulations can be used as a sunscreen in pharmaceutical compositions. In the future, these extracts may be utilized alone or in conjunction with additional ingredients in the future in a variety of dosage forms, such as creams, lotions, and other products that are safer and more cost-effective than chemical sunscreens.

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